



National Energy
Board

Office national
de l'énergie

Short-term Canadian Natural Gas Deliverability

2013-2015



AN ENERGY MARKET ASSESSMENT • MAY 2013

Canada



National Energy
Board

Office national
de l'énergie

Short-term Canadian Natural Gas Deliverability

2013-2015

AN ENERGY MARKET ASSESSMENT MAY 2013

Canada

Permission to Reproduce

Materials may be reproduced for personal, educational and/or non-profit activities, in part or in whole and by any means, without charge or further permission from the National Energy Board, provided that due diligence is exercised in ensuring the accuracy of the information reproduced; that the National Energy Board is identified as the source institution; and that the reproduction is not represented as an official version of the information reproduced, nor as having been made in affiliation with, or with the endorsement of the National Energy Board.

For permission to reproduce the information in this publication for commercial redistribution, please e-mail: info@neb-one.gc.ca

Autorisation de reproduction

Le contenu de cette publication peut être reproduit à des fins personnelles, éducatives et(ou) sans but lucratif, en tout ou en partie et par quelque moyen que ce soit, sans frais et sans autre permission de l'Office national de l'énergie, pourvu qu'une diligence raisonnable soit exercée afin d'assurer l'exactitude de l'information reproduite, que l'Office national de l'énergie soit mentionné comme organisme source et que la reproduction ne soit présentée ni comme une version officielle ni comme une copie ayant été faite en collaboration avec l'Office national de l'énergie ou avec son consentement.

Pour obtenir l'autorisation de reproduire l'information contenue dans cette publication à des fins commerciales, faire parvenir un courriel à : info@neb-one.gc.ca

© Her Majesty the Queen in Right of Canada as represented by the National Energy Board 2013

NE2-1/2013E-PDF
ISSN: 1910-7773

This report is published separately in both official languages. This publication is available upon request in multiple formats.

Copies are available on request from:
The Publications Office
National Energy Board
444 Seventh Avenue S.W.
Calgary, Alberta, T2P 0X8
E-mail: publications@neb-one.gc.ca
Fax: 403-292-5576
Phone: 403-299-3562
1-800-899-1265
Internet: www.neb-one.gc.ca

For pick up at the NEB office:
Library
Ground Floor

Printed in Canada

© Sa Majesté la Reine du chef du Canada représentée par l'Office national de l'énergie 2013

NE2-1/2013E-PDF
ISSN: 1910-779X

Ce rapport est publié séparément dans les deux langues officielles. On peut obtenir cette publication sur supports multiples, sur demande.

Demandes d'exemplaires :
Bureau des publications
Office national de l'énergie
444, Septième Avenue S.-O.
Calgary (Alberta) T2P 0X8
Courriel : publications@neb-one.gc.ca
Télécopieur : 403-292-5576
Téléphone : 403-299-3562
1-800-899-1265
Internet : www.neb-one.gc.ca

Des exemplaires sont également disponibles à la bibliothèque de l'Office :
Rez-de-chaussée

Imprimé au Canada

T A B L E O F C O N T E N T S

List of Figures and Tables	ii
List of Acronyms	iii
List of Units and Conversion Factors	iv
Foreword	v
Chapter 1: Overview and Summary	1
Chapter 2: Background	3
Chapter 3: Key Drivers of Deliverability	5
Chapter 4: Analysis and Outlook	7
Chapter 5: Evaluation of Previous Projection	15
Chapter 6: Recent Issues and Current Trends	16
Appendices	18

L I S T O F F I G U R E S A N D T A B L E S

FIGURES

4.1	Deliverability Results	9
4.2	Natural Gas-Intent Drill Days Comparison	10
4.3	Natural Gas-Intent Wells Drilled Comparison	10

TABLES

4.1	Pricing Overview and Deliverability Results	8
4.2	Mid-Range Price Case Summary and Results	11
4.3	Higher Price Case Summary and Results	12
4.4	Lower Price Case Summary and Results	13
4.5	Average Annual Canadian Deliverability and Demand	14

L I S T O F A C R O N Y M S

CBM	coalbed methane
EIA	Energy Information Administration
EMA	Energy Market Assessment
HH	Henry Hub (U.S. Natural Gas Reference Price)
LNG	liquefied natural gas
NEB	National Energy Board
NGLs	natural gas liquids
PSAC	Petroleum Services Association of Canada
WCSB	Western Canada Sedimentary Basin

LIST OF UNITS AND CONVERSION FACTORS

Units

m ³	= cubic metres
MMcf	= million cubic feet
Bcf	= billion cubic feet
m ³ /d	= cubic metres per day
10 ⁶ m ³ /d	= million cubic metres per day
MMcf/d	= million cubic feet per day
Bcf/d	= billion cubic feet per day
GJ	= gigajoule
MMBtu	= million British Thermal Units

Common Natural Gas Conversion Factors

1 million m³ (@ 101.325 kPaa and 15° C) = 35.3 MMcf (@ 14.73 psia and 60° F)

1 GJ (Gigajoule) = .95 Mcf (thousand cubic feet) = .95 MMBtu = .95 decatherms

Price Notation

North American natural gas prices are quoted at Henry Hub and given in \$US/MMBtu.

Canadian natural gas prices are quoted as the Alberta Gas Reference Price and are listed in \$C/GJ.

FOREWORD

The National Energy Board (NEB or Board) is an independent federal regulator whose purpose is to promote safety and security, environmental protection and efficient infrastructure and markets in the Canadian public interest¹ within the mandate set by Parliament for the regulation of pipelines, energy development, and trade.

The Board's main responsibilities include regulating the construction and operation of interprovincial and international oil and natural gas pipelines, international power lines, and designated interprovincial power lines. Furthermore, the Board regulates the tolls and tariffs for the pipelines under its jurisdiction. With respect to the specific energy commodities, the Board regulates the export of natural gas, oil, natural gas liquids (NGLs) and electricity, and the import of natural gas. Additionally, the Board regulates oil and natural gas exploration and development on frontier lands and offshore areas not covered by provincial or federal management agreements.

For oil and natural gas exports, the Board's role is to evaluate whether the oil and natural gas proposed to be exported is surplus to reasonably foreseeable Canadian requirements, having regard to the trends in the discovery of oil or gas in Canada.² The Board monitors energy markets, and provides its view of Canadian energy requirements and trends in discovery of oil and natural gas to support its responsibilities under Part VI of the *National Energy Board Act* (the NEB Act). The Board periodically publishes assessments of Canadian energy supply, demand and markets in support of its ongoing market monitoring. These assessments address various aspects of energy markets in Canada. This Energy Market Assessment (EMA), *Short-term Canadian Natural Gas Deliverability, 2013–2015*, is one such assessment. It examines the factors that affect natural gas supply in Canada in the short term and presents an outlook for deliverability through 2015.

While preparing this report, in addition to conducting its own quantitative analysis, the NEB held a series of informal meetings and discussions with natural gas producers, pipeline companies, and industry associations. The NEB appreciates the information and comments provided and would like to thank all participants for their time and expertise.

If a party wishes to rely on material from this report in any regulatory proceeding before the NEB, it may submit the material, just as it may submit any public document. Under these circumstances, the submitting party in effect adopts the material and that party could be required to answer questions pertaining to the material.

This report does not provide an indication about whether any application will be approved or not.

The Board will decide on specific applications based on the material in evidence before it at that time.

1 The public interest is inclusive of all Canadians and refers to a balance of economic, environmental, and social considerations that change as society's values and preferences evolve over time.

2 Section 118 of the *National Energy Board Act*: On an application for a licence to export oil or gas, the Board shall satisfy itself that the quantity of oil or gas to be exported does not exceed the surplus remaining after due allowance has been made for the reasonably foreseeable requirements for use in Canada, having regard to the trends in the discovery of oil or gas in Canada.



OVERVIEW AND SUMMARY

This report provides an outlook for Canadian natural gas deliverability³ from the beginning of 2013 to the end of 2015.

- Canadian natural gas appears to be in a “holding pattern” with producers undertaking minimal natural gas drilling activity since current prices do not cover the full costs of developing most natural gas prospects. U.S. production continues to keep the North American natural gas market well supplied, helping keep current natural gas prices below \$4.00/MMBtu.
- Canadian and U.S. producers who switched away from developing dry gas to earn higher returns by developing oil and natural gas liquids (NGLs)-rich prospects appear to be producing enough natural gas as a byproduct to extend this period of abundant North American gas deliverability.⁴ Growth in NGL supply has reduced NGL prices and is eroding some of the incentive behind drilling for wet gas.
- Despite above average temperatures during recent winters and the slow pace of economic recovery, record hot summer temperatures over the last two years resulted in high levels of natural gas use for electricity generation and U.S. gas consumption for 2012 set a new record high. However, more normal summer temperatures in the future may lower this key demand component and remove this upward driver in gas prices.
- Natural gas priced below \$4.00/MMBtu has displaced significant amounts of coal-fired electricity generation. It is not clear if enough of this demand can be retained for natural gas prices to move above the \$5.00/MMBtu level thought to be necessary to encourage a significant resumption in dry natural gas drilling activity. If unable to retain this demand, natural gas prices may remain between \$3.00 and \$4.00/MMBtu.
- The addition of pipeline capacity to deliver shale gas from drilled but previously unconnected wells in the Marcellus Shale of Pennsylvania and West Virginia is bringing forth additional deliverability into an already fully supplied North American market, displacing Canadian natural gas exports in the Northeast U.S. and some domestic sales in central Canada. Further displacement of Canadian natural gas could occur due to the developing Utica Shale in Ohio.
- At current prices of around \$3.00/MMBtu in Western Canada, Canadian natural gas producers are not earning sufficient returns to attract additional equity investment.

³ Deliverability is the estimated amount of gas supply from a given area based on historical production and individual well declines, as well as projected activity. Gas production may be less than deliverability due to a number of factors, such as weather-related supply interruptions, and shut-in production due to economic or strategic considerations.

⁴ NGLs are liquid hydrocarbons including propane, butanes, and pentanes plus. Natural gas containing commercial amounts of NGLs is known as NGL-rich, liquids-rich or wet gas. Dry natural gas contains little or no NGLs. Gas produced from oil wells includes gas in solution within the oil (solution gas) and gas adjacent to the oil within the reservoir (associated gas). Production of solution gas and associated gas is almost entirely dictated by oil operations, and is typically not influenced by natural gas market conditions.

Thus, activities are generally funded through diminishing cash flow and capital commitments from previous joint venture partners. This has imposed significant capital discipline on Canadian producers, thus prompting the industry to reduce costs and continue efforts to boost drilling efficiency. Further, most producers have shifted capital toward drilling tight oil wells. While the Duvernay Shale and the Liard Basin are promising shale gas resources, they are unlikely to have any meaningful impact on Canadian natural gas deliverability over the forecast period.

- In Atlantic Canada, production from the delayed Deep Panuke offshore project is expected to commence in the second half of 2013 and supplement declining output from the Sable Offshore Energy Project.
- Due to lengthy project development timelines, significant liquefied natural gas (LNG) exports from North America are unlikely through the 2015 time horizon of this analysis. LNG exports are therefore not expected to influence gas prices and gas drilling over the study period. Additionally, North America will likely not attract significant additional LNG imports.
- To reflect the uncertainty regarding future natural gas prices, demand and supply, this report considers three alternative cases for how Canadian natural gas deliverability may evolve over the period through 2015. Canadian natural gas investment and drilling levels are projected to remain close to current levels in 2013. Projections will diverge in 2014 and 2015 based on assumptions of either North American deliverability significantly exceeding demand (lower price case) or of deliverability gradually moving closer to demand (mid-range and higher price cases).
- In the Lower Price Case, growth in markets for Canadian natural gas is assumed to be slowed by mild weather conditions, modest economic growth and ongoing displacement by supplies of U.S. natural gas. Although declining, Canadian natural gas deliverability would continue to be more than adequate to meet market requirements largely through new gas supplies produced as a byproduct of increasing oil production, and gas produced in the course of obtaining NGLs. Natural gas prices reach \$3.67/MMBtu in 2015. Deliverability declines steadily from $371 \text{ } 10^6 \text{m}^3/\text{d}$ (13.1 Bcf/d) in 2013 to $323 \text{ } 10^6 \text{m}^3/\text{d}$ (11.4 Bcf/d) in 2015.
- The Higher Price Case includes an expectation of some recovery in markets for Canadian natural gas due to a return to more normal winter weather, continued hot summer weather, stronger economic growth and less displacement by U.S. gas supplies. Power generators continue to prefer natural gas over coal in specific markets despite rising natural gas prices, potentially for environmental benefits or to better match variations in the electricity demand profile. With natural gas prices reaching \$5.95/MMBtu by 2015, more dry natural gas prospects would be developed, leading to higher natural gas drilling and production. Deliverability would continue to decline, but only modestly, reaching $371 \text{ } 10^6 \text{m}^3/\text{d}$ (13.1 Bcf/d) in 2015.
- A Mid-Range Price Case would see moderate growth in North American natural gas demand, coupled with declining Canadian natural gas deliverability and slowing U.S. supply growth, gradually reducing excess deliverability in North American natural gas markets. Prices would reach \$4.35/MMBtu by 2015 and sustain drilling for NGL-rich gas and incent the beginnings of some return to dry gas drilling. Canadian natural gas deliverability would fall to $353 \text{ } 10^6 \text{m}^3/\text{d}$ (12.5 Bcf/d) by 2015.

The Analysis and Outlook section of this report contains the key assumptions for each price case. The Appendices contain a detailed description of the methodology used in projecting deliverability.

BACKGROUND

- Canada produced an average $396 \text{ } 10^6 \text{m}^3/\text{d}$ (14.0 Bcf/d) of marketable natural gas in 2012, or roughly five per cent less than in 2011.⁵ Canadian natural gas production had previously declined from $482 \text{ } 10^6 \text{m}^3/\text{d}$ (17.0 Bcf/d) in 2005 to $413 \text{ } 10^6 \text{m}^3/\text{d}$ (14.6 Bcf/d) in 2011. Western Canada is the major source of Canada's natural gas production and currently accounts for approximately 98 per cent of the country's marketable production. Nova Scotia and New Brunswick⁶ provide most of the remaining natural gas production with minor amounts coming from Ontario, Northwest Territories, and Yukon. Canada's deliverability continues to exceed its own demand needs and the remaining production is exported to the U.S.
- The U.S. averaged $1859 \text{ } 10^6 \text{m}^3/\text{d}$ (65.6 Bcf/d) of marketable natural gas production in 2012. U.S. production was up four per cent over 2011 and has been growing since 2005. U.S. natural gas production occurs in many of the Lower-48 states and offshore in the Gulf of Mexico. Alaskan production does not have access to markets in Canada or the Lower-48 states. Increasing U.S. shale gas production is accommodating more of that country's requirements and reducing the need for imports from Canada.
- Natural gas supply potential in North America is robust since techniques to develop shale gas and tight gas formations through horizontal drilling and multi-stage hydraulic fracturing have become mainstream. The enormous potential supply from these formations has outpaced natural gas demand growth in North America and led to applications to export LNG to overseas markets.
- The long lead times associated with developing supplies and connecting them to markets, coupled with variability in demand due to uncertain weather and economic growth conditions, often results in an imbalance between levels of natural gas deliverability and demand in North America. During periods of insufficient deliverability, prices increase to ration supply toward the markets that most value it and to provide incentive to develop and produce the next most costly natural gas resource. These periods of rising prices often cause rising natural gas deliverability to exceed natural gas demand. At this stage, prices would then decline, discouraging development of the more costly supplies and growing demand, particularly by displacing competing fuels. This cyclical imbalance between supply and demand is typical of North American natural gas markets.
- The current deliverability conditions in North America are likely to follow a similar pattern as in the past, but there are several factors that make it even more difficult to anticipate the duration and extent of the current cycle.
 - A key factor in deliverability is the potential for additional supply through the development of very large tight gas and shale gas resources. Large volumes of gas

5 Marketable (sales) gas is gas that has been processed to remove impurities and NGLs, and meets specifications for use as an industrial, commercial, or domestic fuel.

6 The Canaport terminal in New Brunswick is the only operating LNG import terminal in Canada. Since gas supply for LNG import projects comes from outside the country, LNG imports are not included in this report on Canadian gas deliverability.

available at relatively similar costs have increased the degree of imbalance between North American natural gas supply and demand. Further, the size of the shale gas opportunity encouraged industry to lease very large acreages of land for future development, thereby creating the need to undertake widespread drilling and production to retain these leases, which added to the imbalance.

- While declining natural gas prices would be expected to eventually slow gas production growth, rising NGL prices provided the incentive for industry to target NGL-rich natural gas prospects, continuing to add to abundant natural gas deliverability despite the disincentive of lower natural gas prices. However, growth in NGL supply has subsequently reduced NGL prices, which is eroding some of the incentive behind drilling for NGL-rich natural gas.
- The opportunity to apply horizontal drilling and multi-stage fracturing technologies to access crude oil in tight and shale formations provided additional momentum to natural gas production since some crude oil wells produce natural gas as a byproduct. This associated gas and solution gas may also be produced on the basis of favourable crude oil economics (with little to no regard for natural gas prices) and further contribute to extending the period of natural gas deliverability exceeding demand.
- Significant gas production associated with the development of crude oil in the Bakken Formation in North Dakota did not have access to a pipeline and had to be flared in the field. With the construction of a pipeline in 2013,⁷ it will serve as an additional source of U.S. natural gas supply and another potential competitor for Canadian natural gas being delivered into the U.S. Midwest.
- Development of shale gas near major gas consuming areas has added a pipeline infrastructure aspect to the imbalance between supply and demand. The development of the Marcellus Shale in Pennsylvania and West Virginia, as well as the Utica Shale in Ohio, has implications for Canadian natural gas markets in Ontario, Quebec, and the Midwest and Northeast U.S. Access to new supply sources near market areas is already altering pipeline flows and impacting costs and competitive relationships between existing supply basins.
- The demand response to the rise in shale gas production has already started with gas making major inroads against coal in power generation which could grow even larger, although it may take years for other markets to adapt or develop. Proposed LNG export facilities represent large new natural gas demands, but involve long lead times to obtain approvals, establish overseas markets and construct facilities. The opportunity for natural gas to displace competing fuels in North America's traditional space heating markets had largely already occurred.
- Other potential sources of major demand growth could require years or decades to further develop to any meaningful scale. Examples include a potential significant return of petrochemical industry capacity from overseas locations, and widespread use of compressed natural gas or LNG to displace diesel and gasoline in transportation markets.

⁷ Alliance Pipeline is constructing and will ultimately operate the Tioga Lateral, a 79.3 mile long, 12 inch diameter pipeline that will transport natural gas being produced in association with Bakken oil production to a tie-in along the existing Alliance mainline: www.alliancepipeline.com/Projects/TiogaLateral.

KEY DRIVERS OF DELIVERABILITY

The following supply and demand drivers influence future Canadian natural gas deliverability:

- Increasing U.S. natural gas deliverability continues to keep the North American market well supplied, helping to keep natural gas prices below \$4.00/MMBtu.
- Canadian natural gas producers are minimizing their natural gas drilling since current prices do not cover the full costs of developing most natural gas prospects.
- Canadian and U.S. producers who switched away from developing dry gas toward developing crude oil and NGL-rich prospects appear to be producing enough natural gas as a byproduct to extend this period of abundant North American gas deliverability. Growth in NGL supply is now surpassing NGL demand in some markets. This has reduced NGL prices in North America and is eroding some of the incentive behind drilling for NGL-rich natural gas.
- Despite above average temperatures during recent winters, the slow pace of economic recovery, record hot summer temperatures over the last two years, and historically low natural gas prices resulted in high levels of natural gas use for electricity generation. This helped set a new record high for U.S. gas consumption in 2012. However, more normal summer temperatures in the future may lower this key demand component and remove this upward driver in gas prices.
- Natural gas priced below \$4.00/MMBtu has displaced significant amounts of coal-fired electricity generation. It is not clear whether enough of this demand can be retained if natural gas prices move above the \$5.00/MMBtu level that is generally regarded as providing the incentive for a significant resumption in dry natural gas drilling.
- The addition of pipeline capacity to deliver shale gas from drilled, but previously unconnected, wells in the Marcellus Basin of Pennsylvania and West Virginia is bringing forth additional deliverability into a North American market that already has sufficient supply, thus displacing Canadian natural gas exports in the Northeast U.S. and some domestic sales in central Canada.
- Declining natural gas production and increased gas consumption in the oil sands have reduced the utilization of pipelines leaving Western Canada. As utilization drops, unit transportation costs tend to rise. This affects the competitiveness of Western Canadian gas in markets in Central Canada, as well as markets in the U.S.
- At current prices of around \$3.00/MMBtu in Western Canada, Canadian natural gas producers are not earning sufficient returns to attract additional equity investment. Thus, activities must generally be funded through diminishing cash flow and capital commitments from joint venture partners. This has imposed significant capital discipline on Canadian producers to reduce costs and boost operating efficiency. Further, most producers have shifted capital toward drilling tight oil wells. While the Duvernay Shale

and Liard Basin show promise as sources of natural gas from shale, they are unlikely to have a meaningful impact on Canadian natural gas deliverability over the forecast period.

- In Atlantic Canada, production from the delayed Deep Panuke offshore project could commence in mid-2013 and supplement declining output from the Sable offshore project.
- Due to lengthy project development timelines, significant LNG exports from North America are unlikely over the 2013–2015 period of this analysis. With North American natural gas prices below those in other parts of the world, North America is also unlikely to attract significant additional LNG imports.
- Drilling multiple wells from a single well pad is becoming more widespread, which helps increase efficiency by eliminating the time required to tear down, move, and then set up a rig as it moves from well site to well site. Pad drilling is also extending the drilling season in Canada, because drilling can continue on pads during the spring break-up period when the frozen ground thaws and heavy loads are banned from moving on local roads. Should additional materials be required beyond those stockpiled previously on the pad, they can be delivered in partial loads to satisfy load limits.

ANALYSIS AND OUTLOOK

Natural gas drilling activity in Canada and the U.S. declined to minimal levels by the end of 2012 (Figure 4.2) and is not expected to increase by a significant degree in 2013. Meanwhile, Canadian natural gas deliverability generally continued in a shallow decline through 2012 while U.S. deliverability continued to increase, albeit at a diminishing rate. The small impact of reduced gas drilling on deliverability is largely from natural gas produced as a byproduct of increased drilling for crude oil and NGLs, with oil wells typically not producing natural gas to the same extent as a well that specifically targets natural gas. As a result, it is expected that natural gas deliverability may begin to decline more significantly than has occurred to date. An accelerated decline may cause the North American natural gas market to tighten and result in increased natural gas prices. Key unknowns are the extent to which prices might rise, and what effect a price increase might have on demand, particularly with respect to switching from coal to gas for power generation. Another key unknown is whether a price increase might also result in a return to drilling dry natural gas wells.

To help address these identified uncertainties, this report examines three price cases for Canadian natural gas deliverability (i.e., Lower, Mid-range and Higher Price Case), primarily differing in Canadian and U.S. natural gas prices, the corresponding levels of capital investment, and drilling levels, particularly in Montney and Alberta Deep Basin tight gas, as well as Duvernay and Horn River Basin shale gas. In all three cases, Canadian natural gas investment and drilling levels are projected to remain close to current levels in 2013 and then diverge in 2014 and 2015. The Appendices to this report contain a detailed description of the methodology used for projecting deliverability.

A summary of the key assumptions used in the cases and the deliverability results is shown in Table 4.1:

TABLE 4.1

Pricing Overview and Deliverability Results

	Mid-Range Price Case				Higher Price Case			Lower Price Case		
	2012	2013	2014	2015	2013	2014	2015	2013	2014	2015
Henry Hub (HH) Average Spot Price (US\$/MMBtu)	\$2.75 [a]	\$3.65	\$4.00	\$4.35	\$3.90	\$4.80	\$5.95	\$3.55	\$3.60	\$3.65
Alberta Gas Reference Price (C\$/GJ)	\$2.14 [b]	\$2.90	\$3.25	\$3.60	\$3.15	\$4.05	\$5.20	\$2.80	\$2.85	\$2.90
Natural Gas Drilling Expense (\$ Millions)		2596	3870	4416	3107	4561	6893	2226	2197	1538
Natural Gas Intent Drill Days	15945	13790	20552	23220	16499	24225	31449	11824	11667	8088
Natural Gas Intent Wells	1058 [c]	915	1363	1540	1094	1607	2086	784	774	536
Gas Share of Drill Days (per cent)	37	12	16	18	10	14	20	17	17	14
Size of WCSB Rig Fleet	803	799	796	800	799	796	800	799	796	800
Canadian Deliverability (10⁶m³/d)	396	374	361	353	378	370	371	371	348	323
Canadian Deliverability (Bcf/d)	14.0 [d]	13.2	12.8	12.5	13.3	13.1	13.1	13.1	12.3	11.4

[a] Energy Information Administration (EIA) - Short Term Energy Outlook, 10 January 2013: <http://www.eia.gov/forecasts/steo/data.cfm>.

[b] Government of Alberta, Alberta Gas Reference Price History - January - December 2012: <http://www.energy.alberta.ca/NaturalGas/1322.asp>.

[c] PSAC Estimate - 24 January 2013.

[d] Annual average of NEB reported provincial production, where available.

For this analysis, the Board divides natural gas production in Western Canada into conventional, coalbed methane (CBM), and shale gas categories, with tight gas included as a subcategory in conventional production. Due to large regional differences in geological and production characteristics, the Board further subdivides these categories into smaller geographic areas, or regions, which have similar characteristics for production decline analysis. Within each region, grouping of the producing formations takes place on a geological basis. Details on the characterization of the resources are available in Appendix B. Canadian natural gas production outside of Western Canada includes:

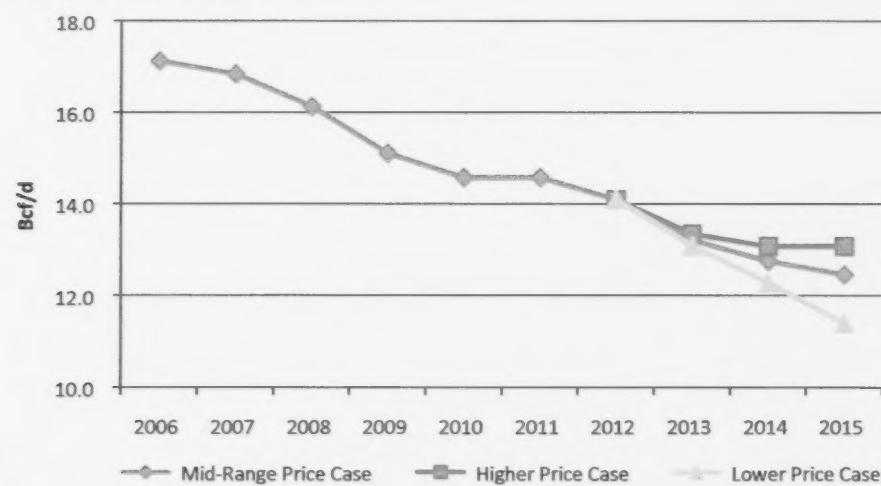
- Onshore production from New Brunswick, Ontario, Yukon, and Northwest Territories, which will continue to decline as minimal future drilling activity is expected over the projection period.
- In this analysis, the Deep Panuke offshore project in Nova Scotia begins producing natural gas in the second half of 2013. The Deep Panuke volumes will help to offset ongoing declines in output from the Sable Island fields.
- Shale gas potential exists in Quebec and New Brunswick; however, insufficient data is available to develop any views on future production potential. Consequently, this report does not show any natural gas deliverability from these areas throughout the projection period.

Deliverability Outlooks

The three price cases provide a range from a Lower Price Case where almost all natural gas drilling is uneconomic unless the gas has a high NGL content, to a Higher Price Case where natural gas deliverability and demand move into balance and provide an incentive for the resumption of dry natural gas drilling. A Mid-Range Case is largely reliant on activity targeting NGL-rich gas as prices do not reach levels that would support much drilling for dry natural gas. A comparison of the three Canadian natural gas deliverability outlooks to 2015 under these alternative market conditions is shown in Figure 4.1.

FIGURE 4.1

Deliverability Results



The levels of drilling activity that provide these deliverability outcomes are the result of capital investment assumptions and estimates of drilling costs. A comparison of natural gas drilling activity in the three cases in terms of drill days and gas-intent wells drilled are shown in Figure 4.2 and Figure 4.3, respectively.

FIGURE 4.2

Natural Gas-Intent Drill Days Comparison

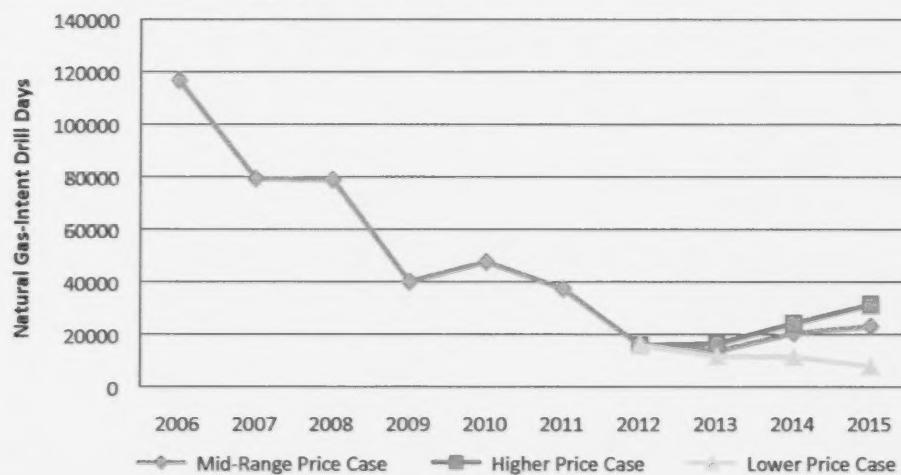
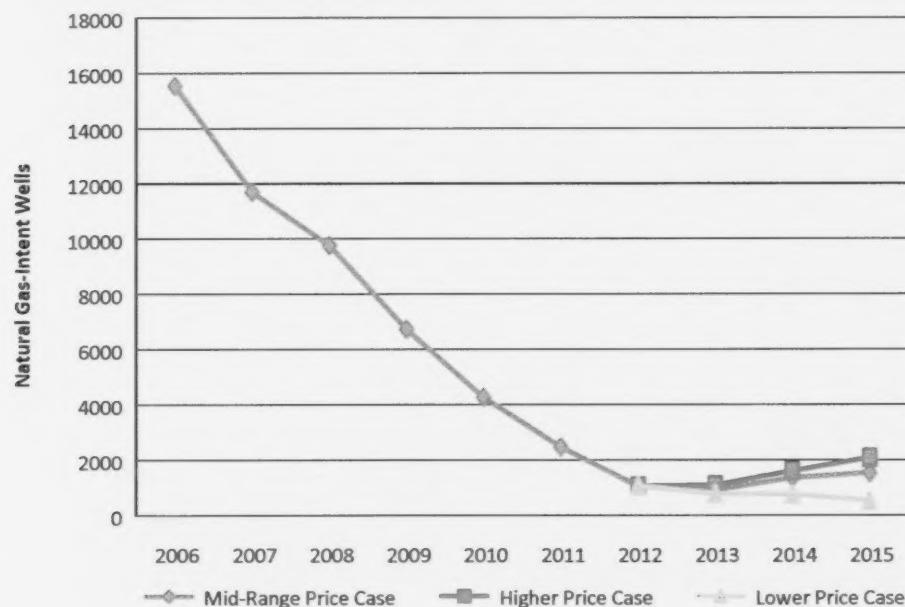


FIGURE 4.3**Natural Gas-Intent Wells Drilled Comparison****Mid-Range Price Case**

For the Mid-Range Price Case, strong supply conditions continue to drive 2013 Canadian and U.S. natural gas prices below those experienced in 2012. After 2013, prices gradually rise, but not enough for much dry gas drilling to become economic. Producers would continue to reduce natural gas drilling, particularly for dry natural gas. With a decrease in overall natural gas drilling, Canadian production declines, and U.S. production growth slows. The demand for natural gas slowly increases, and as the amount of oversupply is reduced, natural gas prices begin to rise gradually. Increased drilling which targets oil will contribute additional gas to overall supply as oil production also brings on associated and solution gas, but total gas deliverability will still be less than in 2012. Liquids-rich natural gas drilling will take place in locations where NGL contents are high enough to make production economic.

Deliverability Results

In the Mid-Range Price Case, the rate of decline in overall deliverability slows slightly from prior years due to higher productivity wells coming on-stream. Tight gas and shale gas activity stabilizes in 2013 with 166 wells drilled in the Montney and 15 in the Duvernay. Drilling in the Horn River Basin is reduced to minimal levels until additional markets emerge in North America or for LNG exports.

Implications

Continued low levels of gas drilling in Canada and the U.S., especially for dry gas, and rising natural gas demand would begin to reduce the oversupply conditions. Meanwhile, growth in Canadian natural gas demand would consume a greater proportion of the country's available deliverability, thereby reducing the net volumes available for export. Prices rise by \$1.60/ MMBtu between 2012 and 2015.

T A B L E 4 . 2
Mid-Range Price Case Summary and Results

	Average HH Price	Gas Intent Drill Days	Gas Intent Wells	Average Deliverability	
	\$US/MMBtu			$10^6 \text{m}^3/\text{d}$	Bcf/d
2012	\$2.75 [a]	15945	1058 [b]	396 [c]	14.0 [c]
2013	\$3.65	13790	915	374	13.2
2014	\$4.00	20552	1363	361	12.8
2015	\$4.35	23220	1540	353	12.5

[a] Energy Information Administration (EIA) - Short Term Energy Outlook, 10 January 2013: <http://www.eia.gov/forecasts/steo/data.cfm>.

[b] PSAC Estimate – 24 January 2013.

[c] Annual average of NEB reported provincial production, where available.

Full results of this case are available in Appendix C.

Higher Price Case

The Higher Price Case would see deliverability closer to demand before the end of the projection period. As natural gas prices rise, a movement back toward natural gas drilling takes place, starting with liquids-rich gas in 2013 and 2014 followed by growth in dry natural gas drilling in 2015. As natural gas prices rise, there may be less substitution of coal-fired electricity generation by natural gas.

Deliverability Results

Canadian natural gas deliverability declines more slowly than in the Mid-Range Price Case because of additional natural gas-intent drilling, decreasing from 396 $10^6 \text{m}^3/\text{d}$ (14.0 Bcf/d) in 2012 to 371 $10^6 \text{m}^3/\text{d}$ (13.1 Bcf/d) by 2015. Liquids-rich natural gas is still the primary source of new production, along with growing volumes of associated and solution gas. Even with a greater increase in price when compared to the Mid-Range Price Case, dry natural gas drilling will not be significant until 2015 when prices reach \$5.95/MMBtu and shallower, less complex dry gas developments begin to attract some capital. Horn River deliverability increases from 8 $10^6 \text{m}^3/\text{d}$ (286 MMcf/d) in 2012 to 9 $10^6 \text{m}^3/\text{d}$ (317 MMcf/d) in 2015. Montney deliverability increases from 48 $10^6 \text{m}^3/\text{d}$ (1.7 Bcf/d) in 2013 to 63 $10^6 \text{m}^3/\text{d}$ (2.2 Bcf/d) in 2015.

Implications

When combined with ongoing increases in solution gas, associated gas, and NGL-rich gas production, additional natural gas drilling will slow the decline in overall deliverability. Overall growth in deliverability will not take place over the projection period, even though natural gas prices rise each year.

TABLE 4.3

Higher Price Case Summary and Results

	Average HH Price	Gas Intent Drill Days	Gas Intent Wells	Average Deliverability	
	\$US/MMBtu			$10^6\text{m}^3/\text{d}$	Bcf/d
2012	\$2.75 [a]	15945	1058 [b]	396 [c]	14.0 [c]
2013	\$3.90	16499	1094	378	13.3
2014	\$4.80	24225	1607	370	13.1
2015	\$5.95	31449	2086	371	13.1

[a] Energy Information Administration (EIA) – Short Term Energy Outlook, 10 January 2013: <http://www.eia.gov/forecasts/steo/data.cfm>.

[b] PSAC Estimate – 24 January 2013.

[c] Annual average of NEB reported provincial production, where available.

Full results of this case are available in Appendix C.

Lower Price Case

The Lower Price Case assumes continued strong supply conditions in North American markets due to significant contributions from production of solution gas, associated gas, and U.S. NGL-rich gas. The Lower Price Case sees substantially less natural gas drilling activity than in the Mid-Range Price Case since most drilling in the Lower Price Case is supported largely by oil and NGL prices. Lower natural gas prices would impact drilling in areas with lesser NGL content as economics for those resources would fall below the economic cut-off. The minimal dry gas drilling in the Mid-Range Price Case would be further discouraged.

Deliverability Results

Canadian natural gas deliverability declines steadily to 323 $10^6\text{m}^3/\text{d}$ (11.4 Bcf/d) in 2015, a decrease of 73 $10^6\text{m}^3/\text{d}$ (2.6 Bcf/d) from 2012. Lower natural gas prices would further reduce the attractiveness of investment in the sector.

Implications

Canadian natural gas consumers would benefit from lower natural gas prices in the short term. However, this case also shows the greatest decline in natural gas deliverability, which has longer term implications for the market. Oil-related activity might be able to compensate for reduced natural gas operations to maintain Canadian drilling and service activity. The potential transition toward oil and away from natural gas would tend to shift some capital investment away from gas-focused British Columbia and into oil-focused Saskatchewan, while the impact would be mixed in Alberta.

TABLE 4.4
Lower Price Case Summary and Results

	Average HH Price	Gas Intent Drill Days	Gas Intent Wells	Average Deliverability	
	\$US/MMBtu			$10^6\text{m}^3/\text{d}$	Bcf/d
2012	\$2.75 [a]	15945	1058 [b]	396 [c]	14.0 [c]
2013	\$3.55	11824	784	371	13.1
2014	\$3.60	11667	774	348	12.3
2015	\$3.65	8088	536	323	11.4

[a] Energy Information Administration (EIA) – Short Term Energy Outlook, 10 January 2013; <http://www.eia.gov/forecasts/steo/data.cfm>.

[b] PSAC Estimate – 24 January 2013.

[c] Annual average of NEB reported provincial production, where available.

Full results of this case are available in Appendix C.

Canadian Deliverability and Demand

The Board's outlook for gas deliverability and Canadian gas demand over the projection period is included in Table 4.5. The Board projects annual Canadian natural gas demand to grow by $14 \text{ } 10^6\text{m}^3/\text{d}$ (0.5 Bcf/d) between 2013 and 2015. Most of this increase in natural gas demand would be from increased usage for oil sands development in Alberta. Canadian natural gas demand is met within the integrated North American market, by a combination of deliverability and imports of U.S.-produced gas.

TABLE 4.5
Average Annual Canadian Deliverability and Demand

	2012		2013		2014		2015	
	$10^6\text{m}^3/\text{d}$	Bcf/d	$10^6\text{m}^3/\text{d}$	Bcf/d	$10^6\text{m}^3/\text{d}$	Bcf/d	$10^6\text{m}^3/\text{d}$	Bcf/d
Canadian Deliverability, Mid-Range Price Case	396	14.0	374	13.2	361	12.8	353	12.5
Total Canadian Demand	291	10.4	296	10.5	306	10.9	310	11.0
Western Canada Demand	190	6.7	192	6.8	200	7.1	203	7.2
Eastern Canada Demand	102	3.6	103	3.7	106	3.8	107	3.8

EVALUATION OF PREVIOUS PROJECTION

The Board's previous projection was provided in its report entitled *Short-term Canadian Natural Gas Deliverability 2012-2014*.⁸ When evaluating the accuracy of these previous projections with actual performance in prices and deliverability, Canadian natural gas prices and deliverability in 2012 tracked very close to the Lower Price Case presented in the previous projection. One aspect that was not fully anticipated in the previous projection was cost reductions due to efficiency improvements such as drilling multiple wells from a single pad.

⁸ National Energy Board. *Short-term Canadian Natural Gas Deliverability 2012-2014*, available at www.neb-one.gc.ca.

RECENT ISSUES AND CURRENT TRENDS

The following developments will influence future North American natural gas deliverability:

- Despite having a very large natural gas resource base, Canadian natural gas deliverability has been declining since 2005. The decline in deliverability is the result of:
 - Natural gas prices moving below the supply cost of most new natural gas developments in Canada;
 - Shrinking markets for Canadian natural gas as growth in U.S. natural gas supply displaces some Canadian gas from markets in Central Canada and from export markets in the U.S.; and
 - Higher economic returns from shifting drilling activity toward crude oil production and NGL-rich natural gas. Oil wells may deliver some volumes of natural gas as a byproduct, but such volumes are generally less than from a natural gas well.
- The decline in North American natural gas prices is the result of the dramatic growth in U.S. shale gas deliverability having outpaced the growth in North American natural gas demand. An imbalance between supply and demand is common in the North American natural gas market, and price responses result in adjustments to the pace of supply and demand growth to move the market toward more balanced conditions.
 - Actions that slow supply growth are underway in the form of significant declines in natural gas drilling in both Canada and the U.S.
 - Near-term responses that increase natural gas demand include increased gas-fired power generation displacing coal-fired generation. Longer-term efforts include proposed LNG exports, natural gas use as a transportation fuel, and further expansion of gas-intensive industries such as petrochemicals.
- If the North American natural gas market moved to more balanced supply and demand conditions, market prices would likely rise and provide financial incentives for industry to begin to develop more of Canada's large natural gas resource base.
- The focus on drilling NGL-rich wells has increased North American NGL supply to the point that prices of NGLs are beginning to fall, tracking closer to lower priced natural gas than being indexed to higher priced crude oil. If this leads to a reduction in targeting NGL-rich wells, further slowing of natural gas production growth may occur.
- More moderate summer temperatures would lessen the draw on gas-fired power generation and would tend to reduce natural gas demand.
- Companies continue to drill some new natural gas wells to add reserves that will replace some portion of the production from existing wells. Maintaining corporate reserves may be necessary to provide cash flow and satisfy requirements on corporate debt that provide a company the financial capability to continue operating.

-
- Some natural gas drilling in Western Canada is likely being postponed since Canadian LNG projects are taking longer than anticipated to obtain sales commitments from gas purchasers. A key issue appears to be resolving pricing terms. Buyers appear to be seeking contracts with prices indexed to lower priced North American natural gas. Sellers appear to be seeking the more traditional indexing to higher priced crude oil.
 - Preliminary industry testing of the extensive Duvernay shale prospect in Alberta is underway and the deliverability forecast includes a range of estimates for Duvernay development. However, more widespread testing and the creation of development strategies will need to occur before the resource is developed extensively.
 - The large potential resource base in the Liard Basin, Horn River Basin, Cordova Embayment, and deeper portions of the Montney Formation is almost all dry gas. Without the benefit of NGL revenues, these resources will be dependent on higher natural gas prices to accelerate development.

Appendix A

- A1 Methodology (Detailed Description)
- A2 Deliverability Parameters - Results
- A3 Decline Parameters for Groupings of Existing Gas Connections
- A4 Decline Parameters for Groupings of Future Gas Connections

Appendix B

- B1 Factors for Allocation of Gas-Intent Drill Days to Areas
- B2 Detailed Gas-Intent Drilling and Gas Connection Projections by Case

Appendix C

Deliverability Details by Case

Appendix D

Total Canadian Deliverability Case Comparison

Appendix E

Average Annual Canadian Deliverability and Demand

